

NON-PUBLIC?: N
ACCESSION #: 9504120060
LICENSEE EVENT REPORT (LER)

FACILITY NAME: WOLF CREEK GENERATING STATION PAGE: 1 OF 8

DOCKET NUMBER: 05000482

TITLE: Problems with the Reactor Trip Manual Actuation Switch
Resulted in Reactor Trip
EVENT DATE: 03/08/95 LER #: 95-001-00 REPORT DATE: 04/07/95

OTHER FACILITIES INVOLVED: DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 100%

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR
SECTION:
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: Richard D. Flannigan TELEPHONE: (316) 364-4117
Manager Regulatory Services

COMPONENT FAILURE DESCRIPTION:
CAUSE: N/A SYSTEM: COMPONENT: MANUFACTURER:
REPORTABLE NPRDS:

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

On March 8, 1995, at approximately 1445 hours, Wolf Creek Generating Station experienced a reactor trip caused by a malfunctioning Reactor Trip Manual Actuation Switch. Instrumentation and control personnel were performing Surveillance Test Procedure STS IC-746B, Revision 7, "Reactor Protection System Reactor Trip Breaker "B" Time Response Testing." Plant response to the reactor trip and engineered safety features actuation was normal, with the exception of the failure of non-safety features bus PA01, "13.8 KV Non Vital Bus," to transfer to its offsite source of power. The failure of PA01 to transfer power sources resulted in the loss of two Circulating Water System Pumps, Condenser Vacuum, two Reactor Coolant Pumps and the subsequent release of steam through the Steam Generator Atmospheric Relief Valves.

The root cause of this event is that the Reactor Trip Manual Actuation

Switch slip contacts did not maintain continuity when the switch was moved from the "normal after close" position to the "closed" position. This intermittent continuity problem caused both the Main Reactor Trip Breaker "A" and Bypass Reactor Trip Breaker "B" to open simultaneously, resulting in the reactor trip. Immediate corrective actions include the revision of the surveillance procedures and establishment of administrative controls to preclude use of this switch at power to conduct surveillances. Long term corrective actions are being evaluated.

END OF ABSTRACT

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Plant Conditions Prior to the Trip:

Operational Status = MODE 1
Reactor Coolant Temperature = 586.5 degrees F
Reactor Coolant Pressure = 2235 psig
Reactor Power = 100%

Basis for Reportability:

10 CFR 50.73(a)(2)(iv) requires the licensee to report any event or condition that resulted in a manual or automatic actuation of any engineered safety feature (ESF) system, including the reactor protection system (RPS).

Description of Event:

On March 8, 1995, at approximately 1445 hours, with the plant in MODE 1 at 100% power, Wolf Creek Generating Station experienced a reactor trip due to a problem with the slip contacts of the Reactor Trip Manual Actuation Switch. Wolf Creek Instrumentation and Control personnel were performing Surveillance Test Procedure STS IC-746B, Revision 7, "Reactor Protection System Reactor Trip Breaker "B" Time Response Testing" JD!. Procedure STS IC-746B is normally performed once per eighteen months, and performed concurrently with the breaker preventive maintenance. This surveillance test is implemented to ensure response times of the reactor trip breakers (both main and bypass) are less than 85 milliseconds.

Plant response to the reactor trip and engineered safety features actuation was normal, with the exception of the failure of non-safety features bus PA01, "13.8 KV Non Vital Bus," EA! to transfer to the offsite source of power. The failure of PA01 to transfer power sources resulted in the loss of two Circulating Water System Pumps BS!, Condenser Vacuum SH!, two Reactor Coolant Pumps AB!, and the subsequent

necessity to release steam through the Steam Generator Atmospheric Relief Valves SB1. Additionally, Valve AL HV0010, "Turbine Driven Auxiliary Feedwater Pump Discharge Header To Steam Generator "B" Isolation," displayed dual position indication. Local inspection of Valve AL HV0010 verified the valve had closed as required and did not render the Turbine Driven Auxiliary Feedwater System inoperable.

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Root Cause and Corrective Actions:

Reactor Trip:

Root Cause:

The root cause of this event has been determined to be that the Reactor Trip Manual Actuation Switch (SB HS0001) slip contacts did not maintain continuity when the switch was moved from the "normal after close" position to the "closed" position. This intermittent continuity problem causes both the Main Reactor Trip Breaker "A" and Bypass Reactor Trip Breaker "B" to open simultaneously, resulting in a reactor trip.

The reactor trip occurred as a result of the 25/26 slip contacts on Switch SB HS0001 opening momentarily. Per design, slip contacts 25/26 are closed both in the "closed" position and the "normal after close" position. Contacts 21/22 are closed in the "normal after trip" and "normal after close" position. Contacts (25/26 and 21/22) are paralleled in the 48V circuit from the Solid State Protection System (SSPS) to the undervoltage coils of the Main Reactor Trip Breaker "A" and Bypass Reactor Trip Breaker "B." When Switch SB HS0001 is taken to the "closed" position, the 21/22 contacts open and the 25/26 slip contacts stay closed. This allows the 48V signal to remain available to SSPS by having one set of parallel contacts remain closed until Switch SB HS0001 is released back to the "normal after close" position in which both sets of contacts are closed. Testing indicated that, on occasion, the 25/26 slip contacts momentarily opened when Switch SB HS0001 was taken from the "normal after close" position to the "closed" position. Therefore, the reactor trip was due to a problem with the 25/26 slip contacts not maintaining continuity while transferring the hand switch from "normal after close" to the "closed" position.

The "trip" position, which is the only safety-related function on Switch SB HS0001, is not affected by this problem, as verified by the performance of STS IC-215, "Trip Actuation Device Operational Test Of Manual Reactor Trip, Trip And Bypass Breaker UV/ Shunt Trip, Turbine Trip On Reactor Trip And P4."

Contributing Factors:

A contributing factor to the reactor trip was determined to be Wolf Creek Nuclear Operating Corporation's (WCNOC) failure to perform a rigorous evaluation of a malfunction of this switch in 1988. By not identifying all potential failure modes of this switch, WCNOC consequently did not implement all needed corrective actions. In 1988 WCNOC

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identified that Switch SB HS0001 was not functioning properly. At that time WCNOC revised Surveillance Test Procedures STS IC-211A, "Actuation Logic Test Train A SSPS" and STS IC-211B, "Actuation Logic Test Train B SSPS," requiring that the breaker manipulations associated with this testing be performed locally, instead of using Switch SB HS0001. However, due to a lack of rigorous evaluation, WCNOC failed to revise procedures STS IC-746A and STS IC-746B, to delete the use of Switch SB HS0001 and require local closure of the breakers. The failure to perform rigorous evaluations and the lack of a questioning attitude was a problem in the 1988 time period at WCNOC. This is an area where WCNOC has made improvement, as noted by several recent NRC inspections.

Corrective Actions:

Immediate:

Work Request 90002-95 was initiated to perform troubleshooting of Switch SB HS0001. Troubleshooting indicated the 25/26 slip contacts momentarily opened when Switch SB HS0001 was taken from the "normal after close" position to the "closed" position. Therefore, the reactor trip was due to the 25/26 slip contacts not maintaining continuity while transferring the hand switch from "normal after close" position to the "closed" position.

Configuration Change Package (CCP 05740) was issued to provide a use-as-is disposition for Switch SB HS0001 until implementation of long term corrective actions. Performance Improvement Request (PIR 95-0366) was initiated to document WCNOC root cause analysis and corrective actions relating to Switch SB HS0001.

Procedures STS IC-746A and STS IC-746B have been revised. Procedures STS IC-215, "Trip Actuation Device Operational Test Of Manual Reactor Trip, Trip And Bypass Breaker UV/Shunt Trip, Turbine Trip On Reactor Trip and P4," and SYS SF-120, "Rod Control System Operation," will be revised by April 14, 1995. These revisions require breaker manipulations to be

performed locally, rather than using Switch SB HS0001. With these revisions all procedures that manipulate the Switch SE HS0001 to the "closed" position have been reviewed and revised.

An Operator Aid (a placard) was placed at the Reactor Trip Manual Actuation Switch (SB HS0001). This Operator Aid states - "WITH ANY RODS WITHDRAWN DO NOT OPERATE SB HS0001 TO THE CLOSED POSITION."

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Long-term:

PIR 95-0366 will further address Maintenance Rule applicability, generic implications, and long term corrective actions.

WCNOC is evaluating replacement switches to preclude installing one that would be susceptible to problems similar to the installed switch. If a satisfactory replacement switch is available, installation of the new switch will be scheduled for the eighth refueling outage, in the Spring of 1996.

STS IC-746B requires the SSPS Train "B" to be placed in test. This test, which was started prior to the reactor trip, was ongoing at the time of the reactor trip. when the SSPS is in test, no automatic actuations will occur from the affected train. During the transient following the reactor trip, reactor coolant pressure dropped below 2185 psig and Valve BB HV8000B, "Pressurizer Power Relief PCV-456A Inlet Isolation," did not close. Valve BB HV8000B receives its closure signal from SSPS Train "B." Operations personnel correctly diagnosed the cause of Valve BB HV8000B not closing. As an enhancement, WCNOC is performing a review of testing procedures that disable portions of the SSPS to identify SSPS equipment disabled by the performance of the procedure. This review is being performed to identify needed enhancements to assure Operations personnel are made aware of the equipment which will be affected by the performance of a specific procedure. The results of this evaluation will be documented in PIR 95-0379. This review is expected to be complete by May 1, 1995. Actions implemented as a result of this evaluation are viewed as an enhancement activity and not as a commitment or corrective action to prevent recurrence of the event documented in this LER.

Coincidental Equipment Problems:

Evaluation Results:

PA01 Failure to Transfer Power Sources:

Observations by Instrumentation and Control, Electrical Maintenance and System Engineering personnel regarding the protective relaying combined with a review of the sequence of events from the plant computer resulted in the conclusion that the onsite source feeder breaker (PA0101) opened sluggishly, resulting in the failure to complete the transfer. Target relays for PA01 Feeder Breakers (PA0110 and PA0101) indicated that both of the feeder breakers were closed for greater time than the time delay on the stuck breaker relay, which has a setpoint of 5 Hz (approximately 83.5 milliseconds). WCNO personnel verified that the PA0101 contact to the stuck breaker relay was open. Breakers PA0110 and PA0101 were

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removed from their cubicles and electrically cycled. While cycling the breakers, it was identified that the charging motor was not working properly and it was replaced. WCNO personnel tested the stuck breaker relay and found that it actuates in 4.88 Hz (81.5 milliseconds) which is within the allowed tolerance limits.

Based on the findings above, the PA0101 breaker trip was tested with a high speed recorder and the identical PA0211 breaker was tested for comparison purposes. At the time of the test the PA0101 breaker had been cycled at least six times which did pre-condition the breaker before the test. The timing of breaker operation was monitored from the time the trip coil was energized to the time that the breaker contacts changed state. The results of the test showed that PA0101 initially tripped in approximately 60 milliseconds and PA0211 tripped in approximately 42 milliseconds. Based on the difference in time, a complete breaker preventive maintenance was performed on PA0101 and PA0211. Upon completion of breaker maintenance, PA0101 tripped at approximately 45 milliseconds and PA0211 tripped at approximately 41 milliseconds, which verified that the PA0101 had been sluggish.

In addition to the above testing, the manufacturer has identified that the Magne Blast breaker maximum acceptable trip time at the nominal voltage is 50 milliseconds, and the best expected trip time would be appropriately 40 milliseconds. Therefore, these values confirmed that the PA0101 breaker was outside the acceptable maximum trip time.

The maintenance history for breaker PA0101 was reviewed and it was determined that the last preventive maintenance was performed in the Fall of 1991.

The root cause for breaker PA0101's sluggish performance was determined to be hardening of the lubricants. The cause of the hardened lubricants is believed to be the extended period since the last performed preventive

maintenance.

Valve AL HV0010 Dual Indication Problem:

When the Control Room Operators attempted to close AL HV0010, they received dual position indication. An operator was dispatched to check the valve's position and determined the valve had closed as required. Work Request 90003-95 was initiated to determine the cause of the dual position indication and to implement corrective actions as appropriate.

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Corrective Actions:

PA01 Failure to Transfer Power Sources:

Preventive maintenance was performed on breaker PA0101; breaker PA0211 was lubricated, and both breakers were retested. The retest indicated that the operation time for breaker PA0101 had been reduced to approximately 42 milliseconds.

PIR 95-0367 was initiated to determine if the failure was a maintenance preventable functional failure. Resolution of this PIR will address the need for any changes to the preventive maintenance program for Magne Blast breakers.

Safety-Related Magne Blast Breakers:

The design function for operability of the safety-related breakers is to open and close on demand plus maintain the proper sequencing. There are no fast bus transfers on the safety-related buses. The safety-related breakers are opened and closed either by manual operator transfers or automatically by the Load Shedder Emergency Load Sequencer. Neither of these manual or automatic transfer/ operations or the coordination with the upstream protective device require the precise timing of a fast bus transfer.

The condition of breaker lubricants can be adversely affected by the atmospheric conditions (amount of dust and heat) the breakers are subjected to. The safety-related breakers are located in a very clean, climate controlled areas which reduces the level of lubricant degradation.

To provide an additional level of confidence in the safety-related Magne Blast breakers' ability to perform their safety-related design function, additional testing was completed on the NB0116 and NB0115 breakers. The

last preventive maintenance activity on breaker NB0116 was performed on October 8, 1991, which was the most extended preventive maintenance frequency on either of the safety-related buses. In addition, this breaker is the least likely breaker to be cycled on a regular basis due to its application. Breaker NB0115 most recently had preventive maintenance performed on January 21, 1993, and is cycled once every quarter during the pump surveillance testing. In addition, two spare safety-related Magne Blast breakers (NB0114 and NB0214) were tested. These spare Magne Blast breakers are kept locally in the safety-related switchgear rooms. The spare breakers most recently had preventive maintenance performed on them in 1988 and 1989 respectively. All of the breakers opened and closed within the manufacturer's acceptance time frame for new circuit breakers.

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The Magne Blast breaker preventive maintenance program is being evaluated on PIR 95-0367. Recent WCNOG extension of the lubrication frequency for all Magne Blast breakers from three to five years versus the recommendation in the vendor bulletin of a maximum breaker lubrication frequency of two years is being evaluated. This evaluation is expected to be completed by May 1, 1995. Until this evaluation is completed, WCNOG will perform, as plant conditions allow, as-found time response testing of safety-related and important to safety breakers which have not been lubricated in the last two years. Following this testing, the breakers will be lubricated. If this testing shows unacceptable performance, the Shift Supervisor will be notified and the appropriate follow-up actions will be taken.

The above evaluation and actions provide reasonable assurance for the continued operability of the safety-related Magne Blast breakers at WCNOG.

Valve AL HV0010 Dual Indication Problem:

WCNOG performed troubleshooting of Valve AL HV0010 position indication and determined the full close limit switch was not making contact as required. The limit switch was adjusted and the valve was retested and the closed position limit switch functioned as required.

Safety Significance:

The only safety-related system not considered operable at the time of the reactor trip was the "B" Motor Driven Auxiliary Feedwater Pump. The "B" Motor Driven Auxiliary Feedwater Pump was considered inoperable because Valve AL V0003, "Motor Driven Auxiliary Feedwater Pump "B" Suction Line

Check Valve," breakover torque was less than the minimum acceptable. This condition did not effect the functional performance capabilities of the pump. The pump started and functioned as designed during the event. An engineering evaluation of Valve AL V0003, which was ongoing at the time of the trip, clearly showed that breakover torque concern did not render the pump inoperable.

No other safety-related systems were out-of-service or being tested which could have impacted the ability of the operators to safely respond to the subsequent transient. During the transient discussed in this report, the unit was placed in a stable, shutdown condition. All plant safety systems responded as designed. At no time did conditions develop that may have posed a threat to the safety of the plant or a threat to the health and safety of the public.

Other Previous Occurrences:

None.

ATTACHMENT TO 9504120060 PAGE 1 OF 1

WOLF CREEK
NUCLEAR OPERATING CORPORATION

Otto L. Maynard
Vice President Plant Operations April 7, 1995

WO 95-0058

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Mail Station P1-137
Washington, D. C. 20555

Subject: Docket No. 50-482: Licensee Event Report 95-001-00

Gentlemen:

The attached Licensee Event Report (LER) is being submitted pursuant to 10 CFR 50.73(a)(2)(iv) concerning a reactor trip. If you should have any questions regarding this submittal, please contact me at (316) 364-8831, extension 4450, or Mr. Richard D. Flannigan at extension 4500.

Very truly yours,

Otto L. Maynard

OLM/jad

Attachment

cc: L. J. Callan (NRC), w/a
D. F. Kirsch (NRC), w/a
J. F. Ringwald (NRC), w/a
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